

1 BEFORE THE STATE OF WASHINGTON
2 ENERGY FACILITY SITE EVALUATION COUNCIL

3 In the Matter of)
4 Application No. 99-1)
5) EXHIBIT _____ (DCE-T)
6 SUMAS ENERGY 2, INC.)
7)
8 SUMAS ENERGY 2 GENERATION)
9 FACILITY)
10 _____)

11 WHATCOM COUNTY'S PREFILED TESTIMONY
12 WITNESS: Dr. David C. Engebretson, Ph.D
13

14 Q: Please introduce yourself to the Council.

15 Ans: My name is David Engebretson. My business address is Dept. of Geology, Western
16 Washington University, Bellingham, WA 98225

17 Q: What is the subject of your testimony?

18 Ans: I wish to address the potential for damaging earthquakes near the site proposed for SE2.

19 Q: What are your professional qualifications to discuss that subject?

20 Ans: I have a B.S. degree in mathematics from Western Washington University, a M.S. degree
21 in geophysics from Stanford University, and a PhD degree in Geophysics from the Stanford
22 University. At present, I am Professor of Geology at Western Washington University. I have
23 taught and performed geophysical and geologic research at the university for the past 18 years.
24 During those years, I have studied the seismicity and geology of Whatcom County. My studies
25 have included projects involving tectonic activity of the region, earthquake hazards, the geologic
structure of the area, landslide hazards, and other geologic phenomena. On a regional scale, I
have studied the tectonic framework of other subduction zones that show close similarities to the
Cascadia Subduction Zone within which the proposed SE2 site lies. I have received 7 research
grants from the National Science Foundation, NOAA, and other agencies and have published 33
professional papers in geologic journals. For a more thorough description of my background and
qualifications, please see my resume, a copy of which is provided as Exhibit DCE-1.

1 Q: What research, if any, have you performed relevant to the proposed site for SE2?

2 Ans: During the last five years, I and my colleagues, Dr Don Easterbrook and Dori Kovanen,
3 have been engaged in studying seismic hazards in Whatcom County, faults that relate to the
4 seismicity of Whatcom county, and the relationship of earthquakes to large landslides in the
5 Nooksack Valley. I have examined all available seismic data that I am aware of in the region
6 and supervised M.S. theses by Lori Roberts on the seismicity of the area and by Paul Pittman
7 that included a drowned cedar forest on Sucia Island that seems to represent abrupt crustal
8 deformation. Sucia island lies in close proximity to the southwestward projection of faults in the
9 Sumas Valley.

10 Q: In your opinion, are seismic risks any greater at Sumas than at other places in the Puget
11 Lowland?

12 Ans: Yes. The SE2 site lies directly above seismic activity. The character (faulting
13 mechanisms) of much of this seismicity is consistent with the Sumas and Vedder Mt. faults (see
14 testimony of Dr. Don Easterbrook). The site is underlain by thick, unconsolidated sediments.
15 No other area in Washington is comparable.

16 Q: Does the existence of these thick unconsolidated sediments increase the likelihood of
17 greater damage from amplified ground shaking?

18 Ans: Yes. It is well known that seismic waves that travel along the surface of the Earth
19 (known s surface waves) are more likely to produce stronger ground acceleration than in areas
20 underlain by bedrock.

21 Q: Do you know of any similar surface and subsurface conditions that have been shown to
22 related to greater earthquake damage in other seismically active regions?

23 Ans: Yes. The correlation between areas of thick, unconsolidated surficial deposits and
24 increased earthquake-induced damage is well known. Two examples include damage during the
25 1989 Loma Prieta (near San Francisco) earthquake and the recent Kobe earthquake in Japan.
During the Loma Prieta earthquake, the Cypress freeway collapse and the devastation in the
Marina District of San Francisco were both located above thick unconsolidated sediments. In
Kobe, the devastation in the harbor region was directly related to amplification of surface waves
within thick unconsolidated deposits. Moreover, the tectonic framework within the Kobe
subduction zone shows many similarities to the Cascadia region. These similarities include the
rate of tectonic movements, proximity to the plate boundary, the age of the approaching oceanic
plates and the direction of that motion relative to the boundary.

Q: Are there other scientific studies that offer insights into the seismic characterization of
the proposed SE2 site?

Ans: Yes. An excellent compilation of earthquake hazard information is available on the
internet at http://www.geophys.washington.edu/seis/PNSN/INFO_GENERAL/eqhazards.html

1 The proposed SE2 site lies within the Cascadia subduction Zone and is surrounded by known
2 historical seismicity.

3 Q: Are scientific discoveries in other portions of the Cascadia Subduction Zone applicable to
4 the SE2 site?

5 Ans: Yes. Most of the scientific inquiry into seismic hazards 4s from seismic events near the
6 proposed SE2 site are nearly identical to those near Seattle. The history of discoveries of active
7 faults near Seattle and northward is useful in understanding the seismic activity of the proposed
8 SE2 site. In the mid 1960s's, the Seattle fault was proposed by geophysicists studying gravity
9 and magnetic data. At that time a large, graben-like depression was proposed. Within the last ten
10 to fifteen years, many new observations have demonstrated that the Seattle fault is active and has
11 many surficial expressions, including a large marine bench uplifted at least 21 feet on the
12 southern end of Bainbridge Island. In the mid 1990s, the existence of another active fault that
13 lies near southern Whidbey island was discovered. Within the past three years, the Devil's
14 Mountain Fault, which extends through offshore waters onto land near Mt. Vernon, was shown
15 to be active. Our own research strongly supports the contention that faults of similar scale and
16 earthquake potential exist within the San Juan Islands and extend through the Sumas Valley. In
17 my opinion, there are no good scientific reasons to think that the Sumas Valley has less potential
18 for damaging seismic activity than these other areas within the Cascadia Subduction Zone. In my
19 opinion, the geologic conditions at the proposed SE2 site, taken together with known historical
20 seismicity and lessons learned from regional and global geology, are seismically dangerous.
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END OF TESTIMONY